<u>Amendments to the Claims:</u>

Claims 1, 19, 21, 44, and 50 have been amended herein. Please note that all claims currently pending and under consideration in the referenced application are shown below. Please enter these claims as amended. This listing of claims will replace all prior versions and listings of claims in the application.

<u>Listing of Claims</u>:

1. (Currently Amended) An apparatus for measuring at least one characteristic of a surface in a chamber, the apparatus comprising:

a sensor configured to emit a first energy beam relative to the surface, ~~and to~~ detect a second energy beam therefrom <u>and provide an output signal from which at least one characteristic associated with the surface may be determined</u>; and

an arm coupled to the sensor, the arm configured to transport the sensor relative to the surface.

2. (Original) The apparatus of claim 1, wherein the first energy beam comprises a visible light beam, an ultraviolet light beam, an infrared light beam, a radio frequency beam, a microwave beam or an ultrasound beam.

3. (Original) The apparatus of claim 1, further comprising a pedestal positioned proximate a target surface, the target surface comprising the surface in the chamber, wherein the sensor and the arm coupled thereto are configured, positioned and sized to enter a gap between the target surface and the pedestal, wherein the arm is further configured to transport the sensor into the gap without contacting the pedestal or target surface.

4. (Original) The apparatus of claim 3, wherein the sensor is configured to measure at least one characteristic comprising at least one of target surface roughness and a presence of asperities on the target surface.

5. (Original) The apparatus of claim 3, wherein the sensor comprises:
a transceiver configured to emit the first energy beam toward the target surface and to detect a first portion of the second energy beam; and
at least one first detector configured to detect a second portion of the second energy beam.

6. (Original) The apparatus of claim 5, wherein the first portion of the second energy beam comprises a coherently reflected portion of the first energy beam from the target surface, and the second portion of the second energy beam comprises a scattered portion of the first energy beam from the target surface.

7. (Original) The apparatus of claim 5, wherein the at least one first detector is disposed in a matrix surrounding the transceiver.

8. (Original) The apparatus of claim 5, further comprising an imaging device configured to direct the first portion of the second energy beam to the transceiver and to direct the second portion of the second energy beam to the at least one first detector.

9. (Original) The apparatus of claim 5, wherein the transceiver comprises a second detector and a source element configured to emit the first energy beam.

10. (Original) The apparatus of claim 9, wherein the transceiver further comprises a light-directing element configured to direct the first portion of the second energy beam to the second detector.

11. (Original) The apparatus of claim 9, wherein the source element comprises a collimator configured to collimate the first energy beam as it exits an optical fiber.

12. (Original) The apparatus of claim 11, further comprising a transmitter optically coupled to the source element through the optical fiber, the transmitter configured to transmit the first energy beam to the collimator.

13. (Original) The apparatus of claim 9, wherein the at least one first detector and the second detector each comprise a collimator configured to collect the second energy beam incident thereon into a corresponding optical fiber.

14. (Original) The apparatus of claim 13, further comprising a receiver optically coupled to the at least one first detector and the second detector through each corresponding optical fiber, the receiver configured to generate an electronic sensory signal for each collimator related to a magnitude of the second energy beam incident thereon.

15. (Original) The apparatus of claim 3, wherein the sensor comprises a detector and a source element configured to emit the first energy beam toward the detector.

16. (Original) The apparatus of claim 15, wherein the source element is further configured and positioned to emit the first energy beam substantially parallel to the target surface and to illuminate an asperity thereon.

17. (Original) The apparatus of claim 1, wherein the sensor is configured to characterize material deposited on the surface in the chamber.

18. (Original) The apparatus of claim 17, further comprising:

a transmitter optically coupled to the sensor, the transmitter configured to transmit the first energy beam to the sensor; and

a spectrometer optically coupled to the sensor, the spectrometer configured to generate sensory signals related to spectra of the second energy beam incident thereon.

19. (Currently Amended) The apparatus of claim 18, wherein the spectrometer is selected from the group ~~comprising~~ consisting of a Raman spectrometer and an infrared absorption spectrometer.

20. (Original) The apparatus of claim 18, wherein the spectrometer comprises:
a first mirror;
a second mirror configured to move relative to the first mirror;
a beam splitter interposed between the first mirror and the second mirror; and
a receiver configured to generate the sensory signals.

21. (Currently Amended) The apparatus of claim ~~19~~ 20, wherein the receiver comprises:
a grating configured to disperse the second energy beam; and
a detector configured to generate sensory signals related to Raman spectra of the dispersed second energy beam.

22. (Original) A method for measuring the roughness of a sputtering target surface, the method comprising:
selectively positioning a sensor relative to the target surface;
illuminating a portion of the target surface with an energy beam;
detecting a coherently reflected portion of the energy beam;
detecting a scattered portion of the energy beam; and
relating a ratio of the coherently reflected portion of the energy beam and the scattered portion of the energy beam to a surface roughness.

23. (Original) The method of claim 22, wherein selectively positioning the sensor comprises moving the sensor.

24. (Original) The method of claim 22, wherein selectively positioning the sensor comprises inserting the sensor into a gap between the target surface and a pedestal positioned proximate the target surface.

25. (Original) The method of claim 22, wherein illuminating the portion of the target surface with the energy beam comprises emitting a coherent light beam from the sensor.

26. (Original) The method of claim 25, wherein emitting the coherent light beam comprises collimating the coherent light beam as it exits an optical fiber.

27. (Original) The method of claim 22, wherein detecting comprises collecting the coherently reflected portion of the energy beam and the scattered portion of the energy beam into a plurality of optical fibers.

28. (Original) A method for detecting asperities on a sputtering target surface, the method comprising:
selectively positioning a sensor relative to a portion of the target surface;
emitting an energy beam substantially parallel to the target surface;
illuminating a portion of the asperities with the energy beam; and
measuring a change in the energy beam.

29. (Original) The method of claim 28, wherein selectively positioning the sensor comprises moving the sensor on an arm.

30. (Original) The method of claim 28, wherein selectively positioning the sensor comprises inserting the sensor into a gap between the target surface and a pedestal positioned proximate the target surface.

31. (Original) The method of claim 28, wherein emitting the energy beam comprises collimating the energy beam as it exits an optical fiber.

32. (Original) The method of claim 28, wherein measuring the change in the energy beam comprises:
detecting the energy beam after illuminating the portion of the asperities; and
sensing a reduction in power between the emitted energy beam and the detected energy beam.

33. (Original) The method of claim 32, wherein detecting comprises collecting the energy beam into an optical fiber.

34. (Original) A method for analyzing deposits on a surface in a sputtering chamber, the method comprising:
selectively positioning a sensor relative to a portion of the surface;
illuminating the portion of the surface with a first energy beam;
detecting a second energy beam from the portion of the surface illuminated; and
performing a spectral analysis on the detected second energy beam.

35. (Original) The method of claim 34, wherein selectively positioning the sensor comprises moving the sensor to a location proximate the portion of the surface.

36. (Original) The method of claim 34, wherein selectively positioning the sensor comprises placing the sensor proximate a window outside the sputtering chamber.

37. (Original) The method of claim 36, further comprising emitting the first energy beam into the sputtering chamber through the window.

38. (Original) The method of claim 34, wherein illuminating the portion of the surface with the first energy beam comprises emitting an infrared light beam from the sensor.

39. (Original) The method of claim 38, wherein performing the spectral analysis comprises employing Fourier-transform infrared spectroscopy.

40. (Original) The method of claim 34, wherein illuminating the portion of the surface with the first energy beam comprises emitting a light beam having multiple wavelengths from the sensor.

41. (Original) The method of claim 40, wherein detecting the second energy beam comprises receiving a Raman scattered light beam as the second energy beam.

42. (Original) The method of claim 41, wherein performing the spectral analysis comprises employing Raman spectroscopy.

43. (Original) A sputter deposition system comprising:
a chamber;
a sensor assembly configured to measure at least one characteristic of a surface in the chamber;
an arm configured to attach to a portion of the sensor assembly, the arm configured to selectively transport the portion of the sensor assembly in the chamber; and
a controller electrically coupled to the sensor assembly.

44. (Currently Amended) The sputter deposition system of claim 43, wherein the at least one characteristic of the surface in the chamber is selected from the group ~~comprising~~ consisting of erosion of the surface, roughness of the surface, a presence of asperities on the surface, a composition of deposits on the surface, and a concentration of deposits on the surface.

45. (Original) The sputter deposition system of claim 43, wherein the portion of the sensor assembly attached to the arm comprises a source element and at least one detector.

46. (Original) The sputter deposition system of claim 45, wherein the source element and the at least one detector each comprise a collimator configured to interface light with an optical fiber.

47. (Original) The sputter deposition system of claim 43, wherein the sensor assembly comprises:

a transmitter configured to receive a first electronic signal from the controller and to emit a first energy beam; and

a receiver configured to receive a second energy beam and to communicate a second electronic signal related to the second energy beam to the controller.

48. (Original) The sputter deposition system of claim 47, wherein the receiver comprises a spectrometer.

49. (Original) The sputter deposition system of claim 43, further comprising a robot electrically coupled to the controller, the robot configured to move the arm relative to the surface in the chamber.

50. (Currently Amended) The sputter deposition system of claim 49, further comprising at least one peripheral device configured to electrically couple to the controller, wherein the at least one peripheral device is selected from the group ~~comprising~~ consisting of chamber circuitry, an input device, an output device and a data storage device.